High strength micro structural forms in titanium alloys processed with rapid heat treatment.

O.M. Ivasishin

G.V. Kurdyumov Institute for Metal Physics, 36 Vernadsky Blvd., 03142 Kyiv, Ukraine

Titanium alloys are attractive materials for aerospace and automotive applications due to their high strength/density ratio, good hardenability and fatigue performance. Their mechanical properties can be significantly improved by heat treatment as the result of substantial changes in phase composition and microstructure (grain sizes, shapes, orientation distribution and morphology of phase consistent). Considerable effort has been expended to develop new approaches for thermomechanical processing of titanium alloys, with the aim to obtain microstructures with the best balance of mechanical properties.

Rapid heat treatment (RHT) of titanium alloys proved to affect the mechanism and kinetics of phase transformation and the formation of modified microstructure in comparison to conventional heat treatments. Microstructural effects associated with RHT, include microstructural refinement on a grain size scale as well as the formation of finer microstructural components in the grain interiors due to microchemical inhomogeneity and substructure of the high-temperature phase.

In this paper, a physical background as well as examples of RHT application to improve the mechanical properties of $\alpha+\beta$ as well as β titanium alloys will be presented.